#17 Declaration
10/20/99
tw

Attorney Docket No. M1043/20006

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
PATENT EXAMINING OPERATION

Applicant	: Edward W. Moll
Serial No.	: Continuing Prosecution Application based on A.S.N. 08/835,625
Filed	: October 12, 1999
For	: THOUGHT CONTROLLED SYSTEM
Examiner	: J. Tweel
Group Art Unit	: 2736

DECLARATION UNDER 37 CFR §1.132

I, EDWARD W. MOLL, a United States citizen, residing at 7 West Bluebell Lane, Mt. Laurel, New Jersey 08054, hereby Declare and say that:

1. I am the inventor of the invention disclosed in the above-identified patent application.
2. I am presently a consultant in telecommunications and computer systems d/b/a Moll Innovations.
3. I am a 1960 graduate of Rochester Institute of Technology (RIT) with a degree of Associate in Applied Science.
4. I have 31 years of experience in the telephone business and 10 years in computer design, with special expertise in voice and data compression, transmission, switching, T1 MUX, voice/data networks and systems.
5. I have worked as an engineer over the past 40 years for a number of engineering

companies, including Ford Aerospace and Communications Corp., ITT, General Electric, Burroughs Corp., Honeywell and Bell Telephone of Pennsylvania.

6. I currently hold twelve U.S. patents, either as a sole inventor or as a co-inventor, as set forth below:

-U.S. Patent No. 5,600,316
-U.S. Patent No. 5,434,568
-U.S. Patent No. 5,027,387
-U.S. Patent No. 4,412,306
-U.S. Patent No. 4,280,192
-U.S. Patent No. 4,016,494
-U.S. Patent No. 3,920,916
-U.S. Patent No. 3,593,314
-U.S. Patent No. 3,508,079
-U.S. Patent No. 3,505,878
-U.S. Patent No. 3,426,330
-U.S. Patent No. 3,426,329

7. The present invention is a system and method for a thought controlled system (hereinafter the "TCS") wherein the TCS controls a computer operation based on at least one stimulus sensed from at least one user thought.

8. I have studied the Office Action issued by the PTO dated April 13, 1999 and all of the grounds cited by the PTO in rejecting the claims of this application; in particular the 35 U.S.C. §112, first paragraph ground and the 35 U.S.C. §103(a) grounds.

9. I assert that the A.S.N. 08/835,625, as originally filed on April 9, 1997, does comply with 35 U.S.C.§112, first paragraph in that it does enable one skilled in the art to which it pertains to make and/or use the invention for the reasons set forth below.

10. The sensing of at least one stimulus from at least one user thought is known, and was known, at the time of filing of A.S.N. 08/835,625, by those skilled in the art as shown by the following references in the Specification of A.S.N. 08/835,625 and by the corresponding prior art references:

11. Voluntary thought: A.S.N. 08/835,625 Pg. 2, 3, 18 and 26:

"The present invention is ... finding the radiating properties of the human

brain and selectively applying these findings to the control of computerized devices." (A.S.N. 08/835,625, p. 2, lines 3-5);

"The user's choice of his or her thought process for control is aided by ... word dictionary, sounds, pictures, smells and other means of thought provocation." (A.S.N. 08/835,625, p. 26, lines 18-21)

Voluntary control of thoughts to move a uniquely detectable finger or foot movements "... [subjects] were instructed to produce unilateral self-paced finger or foot movements at a slow pace." Ref. Bocker, K.B.E. et al. A spatio-temporal dipole model of the readiness potential in humans. I finger movement. Electroencephalography and clinical Neurophysiology, 91 (1994) 275-285, P. 277 lines 41-42

References of selective, voluntary and self-actuated detecting and recording thoughts are: Ref. Bocker, K.B.E et al. A spatio-temporal dipole model of the readiness potential in humans. II foot movement. Electroencephalography and clinical Neurophysiology, 91 (1994) 286-294, earlier Ref. to Bocker, "... Finger Movement", Ref. D. Cheyne and H. Weinberg ('89), Neuromagnetic fields accompanying unilateral finger movements: pre-movement and movement-evoked fields, Experimental Brain Research (1989), 78:604-612, Ref. Douglas Cheyne, Rumyana Kristeva and Luder Deecke, Homuncular organization of human motor cortex as indicated by neuromagnetic recordings, Neuroscience Letters, (1991) 122: 17-20 and Ref. H. Walter, R. Kristeva,U. Knorr, G. Schlaug, Y. Huang, H. Steinmet, B. Nebeling, H. Herzog and R.J. Seitz, Individual somatotopy of primary sensorimotorcortex revealed by intermodalmatching of MEG, PET and MRI, Brain Topography 1992, V. 5, No.2.

12. Detectable Thought re: Finger/foot: A.S.N. 08/835,625 contains many TCS feature scenarios, however, the basic foundation is the detection of self-actuated voluntary thoughts which evoke stimuli to produce control functions.

Describing specific thoughts in A.S.N. 08/835,625 is:

"... thoughts for TCS operation. ... specific brain functions which stimulate recognizable SDC 101 outputs are the users concentration on: 1) the thought on saying a particular word, 2) realizing a simple article or 3) action type *thinking of a particular muscle movement*, i.e., foot, arm, hand, finger, etc.." (emphasis added, A.S.N. 08/835,625 p. 28 lines 1-5).

The phrase "... thinking of a particular muscle movement, ...", is further supported by the following references: earlier Ref. to Bocker, "... Finger movement", earlier Ref. to Bocker, "...Foot movement", earlier Ref. to D. Cheyne and H. Weinberg ('89), and Ref. Douglas Cheyne, et al. ('91), later Ref. H. Walter '92 and Ref. A. Ikeda, H.O. Luders, H. Shibasaki, T.F. Collura, R.C. Burgess, H.H. Morris 3rd and T. Hamano, Movement-related potentials associated with bilateral simultaneous and unilateral movements recorded from human supplementary motor area, Electroencephalography and clinical Neurophysiology, Vol. 95 (Nov. 1995) 323-34.

Figure 5 of Ref. Bocker, "... Finger Movement", P. 281 illustrates spatio-temporal dipole model of the left finger readiness potential verifying the ability to "... separate the activity of multiple functional areas within the [brain] posterior wall and the crown of MI in time and space." earlier Ref. to Bocker, "... Finger Movement", P. 281 and P. 284, Lines 29-31.

Figure 6 of Ref. Bocker, "... Finger Movement", P. 281 illustrates spatio-temporal dipole model of the right finger readiness potential verifying the ability to "... separate the activity of multiple functional areas within the [brain] posterior wall and the crown of MI in time and space." earlier Ref. Bocker, "... Finger Movement", P. 281 and P. 284, Lines 29-31.

Figure 4a of Ref. Bocker, "... Foot Movement", P. 290 illustrates spatio-temporal dipole model of the left foot readiness potential verifying the ability to separate the activity of multiple functional areas within the brain. This figure further differentiates stimuli potential location patterns, similar in format, to figures 5 and 6 of Bocker above, is representative of movement of the left foot, earlier Ref. to Bocker, "... Foot Movement."

Figure 4b of Ref. Bocker, "... Foot Movement", P. 290 illustrates spatio-temporal dipole model of the right foot readiness potential verifying the ability to separate the activity of multiple functional areas within the brain and, similar in format to Bocker's figures 5, 6 and 4a, is representative of muscle movement. This Fig. 4b further differentiates stimuli potential location patterns from Bocker's Figs. 5, 6 and 4a allowing for the assignment of at least four (4) different function controls 307 to be utilized, earlier Ref. to Bocker, "... Foot Movement".

Bocker's Figures 5, 6, 4a and 4b above, along with Ref. H. Walter's Fig. 2 and Table 1 below, provide clear evidence of the ability to detect and differentiate thought patterns of the brain. Fig. 2a of illustrates images of stimuli potential locations, earlier Ref. H. Walter et al., evoked by the subject's thought to move the finger; This Fig. 2b movement of the thumb; Fig. 2c movement of the right cheek; and Fig. 2d movement of the foot. Fig. 2 is a "Display of dipole locations of the movement evoked fields ... by right side voluntary movements in integrated MEG/PET/MR images." It is followed by "The exact axial dipole locations are given in Table 1.", earlier (Pg.2) Ref. H. Walter. Fig. 2 and excerpts of Table 1 are for index finger, thumb, cheek/mouth and foot movements in sections a, b, c, and d of Fig. 2 respectively. The exact locations and difference in locations are shown in Ref. H. Walter and Table 1 below:

Table 1

Movement	Coordinates			Differences		
	x(mm)	y(mm)	z(mm)	x(mm)	y(mm)	z(mm)
Foot	141.0	158.0	210.5	+16.7	-15.4	+ 6.5
Thumb	157.0	146.0	192.0	- 1.8	-13.8	+ 1.0
Index Finger	169.0	153.0	206.0	+ 4.4	-14.6	+15.0
Mouth	170.0	144.0	186.0	- 3.9	- 4.9	+ 8.0

Fig. 3 of Ref. Cheyne, et al. '91, P.19, shows the ability of MEG combined with Magnetic Resonance Imaging (MRI) to display and differentiate between stimuli locations provoked by voluntary, and without the use of external stimulation, efforts by a subject to initiate movements. All on the right side of the body, the movements were of the foot, wrist, 2nd digit, thumb, 5th digit, face, and tongue, earlier Ref. Douglas Cheyne, et al. ('91).

"Fig. 3A shows the locations of the fitted dipole sources in the head coordinate system of one subject who performed 7 different movements including: flexions of the right thumb, index finger, small finger and wrist, dorsiflexions of the right foot and protrusions of the tongue." earlier (Pg. 2) Ref. to Douglas Cheyne, et al. '91 P. 19, Lines 6-10.

Attention is called to A.S.N. 08/835,625: Artifacts ... within the stimuli signals ... stimuli utilization. ... as usable stimuli, the multiple blink of the eyes ... precipitate helpful artifacts." p. 43 lines 7-11.

A user thought of blinking an eye is a usable stimuli for TCS. "EEG responses have been observed in the posterior parts of the brain about 200 ms after I blink artifacts." Ref. Riitta Hari, Human cortical functions revealed by magnetoencephalography, Progress in Brain Research, Vol. 100, (1994) 163-168, P. 166, lines 7-8.

13. Readiness Potential: A.S.N. 08/835,625 Pg. 26, line 9; Pg. 31, line 9; Pg. 10, line 19; More rapid communication from the user by detecting Readiness

Potential in the brain before movement.

"... [magnetic fields] increase in amplitude beginning approximately 1second prior to onset of EMG activity in the flexor muscles of the forearms ...", earlier Ref. to D. Cheyne '89, P. 605, Lines 50-53 Re. A.S.N. 08/835,625 "Decision factors may include precedence of stimuli, sequence of stimuli,..." Page 26, Line 9.
Readiness Potential (RP) is employed for precedence of stimuli, sequence of stimuli.

"Voluntary movements preceded by a slow magnetic field share beginning about 500ms prior to EMG onset and reaching peak amplitudes of 100 -- 200 fT at, or immediately prior to EMG onset (Fig. 1A)." earlier Ref. Douglas Cheyne, et al. '91 P. 18, 9-12.

"... by spatio-temporal dipole modeling is possible to discriminate unilateral from bilateral generators of the UP preceding finger flexions, which will be represented by either 1 dipole or a symmetrical pair of dipoles, respectively.", earlier Ref. Bocker, "... Finger Movement", P. 277, Lines 9-13.

"... a simple self-paced finger movement is preceded by a slow negative potential starting 1500 msec before movement onset. This potential has become known as the Bereitschaftspotential (BP) or readiness potential (UP).", earlier Ref. Bocker, "... Finger Movement", P. 275 lines 2-6.

14. Function Designation 205 in A.S.N. 08/835,625: P. 25, 11.

Once the output from the stimuli input means are transmitted to the computer, the TCS software begins to create a database that stores various brain activity (at least one stimuli) which is then associated with a designation. For example, the computer may display a label, or an image, e.g., the phrase "print a document", or a graphical depiction of a printer and a right hand moving the index finger may be displayed on the screen. If the user wants to print a document then he/she consciously thinks "move the right index finger". The stimuli input means then detect those stimuli from the brain that are active when the user consciously thinks about moving the right index finger. After doing this association a few times for verification, the computer now has a reliable correspondence of the at least one stimuli with the command "print a document." Thus, whenever, the particular user is connected to the stimuli input means and thinks of "moving the right index finger", her/his brain will generate the at least one stimuli that will be detected by the stimuli input means and transmitted to the TCS. The TCS software will then recognize the particular stimuli as "print the document" and the TCS

will respond by printing the document.Therefore the user may need to perform a translation in his or her mind." A.S.N. 08/835,625 Pg. 29, Lines 7-8.

Just as a typist sees a letter and his/her mind automatically translates this to a particular finger and a particular finger movement in order to type the letter, the user in the TCS deliberately thinks "move finger" to select "PRINT" from the menu. See A.S.N. 08/835,625, p. 29, lines 7-8. Subsequently it could be said that a moving finger graphic could accompany the print menu choice.

A.S.N. 08/835,625's suggestion to improve reliability is "... where two stimuli sources are found to be associated and always coactive, the uniqueness of this stimuli will provide increased dependability." Page 31, Line 8-10.

Readiness Potential (RP) can be used for multiple sensing: "... multiple cortical areas may be active during the preparation and execution of voluntary movements, in particular sources active in sensorimotor or cortex in the region of the rolandic fissuer." earlier Ref. to D. Cheyne and H. Weinberg ('89), P. 605 lines 12-16.

"... magnetic flux over the scalp was recorded in normal subjects during self-paced, unilateral finger movements in an attempt to identify cortical sources associated with the performance of simple voluntary movements." earlier Ref. to D. Cheyne and H. Weinberg ('89), P. 605, 29-34.

In addition to an individual thought or stimuli, TCS' detects thought patterns, groups of thoughts, and thought categories by detecting activity of more than one stimulus on selected areas of the brain. The word "category" appears 5 times and the word "pattern" appears 18 times in A.S.N. 08/835,625.

15. Helmet in A.S.N. 08/835,625: Pg. 43, 15-21

Regarding A.S.N. 08/835,625 statement: "Helmet mounted SQUIDs, or an improvement thereof, will provide better localization accuracy and user mobility ..." page 43, lines 15-16.

A SQUID helmet design is part of an MEG/MSI produced by Biomagnetic Technologies, Inc.

"Sensor Geometry Helmet design Accommodates 98th percentile adult head size" Ref. Magnes-WH Whole Head Magnetic Source Imaging System", Biomagnetic Technologies, Inc., Technical Specification 1/95.

Earlier Ref. to Hari, submitted with A.S.N. 08/835,625, illustrates a Helmet mounted with SQUIDs as shown in Hari Fig. 1C and 2B

Re. Helmet as a helmet-shaped SQUID sensor array as presented by Hari, "... it is now possible to record signals simultaneously over the entire cortex [with the whole-head helmet-type magnetometer]" earlier

Ref. R. Hari, Pg. 163, Line 12 and Fig. 1C and 2B.

Fig. 2B shows field patterns of a Fig. 1C helmet during a negative potential reading over the left (LH) and right (RH) brain hemispheres, earlier Ref. to Hari Fig. 1C and 2B.

An improved helmet example for mobility and particularly in terms of overcoming the high cost of MSI/MEG is Tucker using a helmet to accomplish EEG readings similar to the quality of an MSI or MEG.

> "Recent studies suggest that the spatial localization from electrical (EEG) data may be similar to that from magnetic (MEG) data." earlier Ref. to D. M. Tucker, Pg. 154, 17-19.
>
> "... the cost per channel for EEG is now around 1-5% of that for MEG, ..." earlier Ref. to D. M. Tucker, Pg. 154, 22-23.

16. Combined technologies 08/835,625 Pg. 25, Line 15; Spec. Page 25, Line 15.

The mode of this invention includes but is not limited to SQUID and EEG type equipment. A SQUID system combined with EEG and ECG apparatus is shown in earlier Ref. to Schneider, Fig. 2.

> "...combination of biomagnetic evaluation with MR imaging, because the latter modality provides three-dimensional images. To enable fusion of biomagnetic localizations with MR images ... achieved during a magnetoencephalographic (MEG) investigation ..." earlier Ref. to Schneider, Pg. 826, Lines 12-20.
>
> "Simultaneously with the MEG, and EEG was recorded ..." earlier Ref. to Schneider, Pg. 827, Col. 3, Lines 5-6.

Supporting combining MR with MEG, a SQUID biomagnetimeter,

> "... sources of localization errors (may be) ... coordinate transfer into the magnetic resonance (MR) image, system noise, 'biologic' noise from electrical background activity of the human body, and modeling inaccuracies. Influence of system noise with phantoms, and an error of 1-2 mm was found. The reproducibility of the head position in the MEG device and the MR imaging system is typically 2 mm for a point in the temporal region and about 4mm for a point in the occipital region" earlier Ref. to Schneider, Pg. 829, Col. 1.

Re. A.S.N. 08/835,625:

> "TCC 100 may be assisted by auxiliary sensing apparatus such as may be connected via auxiliary stimuli detection 105.", Page 25, Lines 14-15.

Examples of combining technologies which are compatible with stimuli detection and conditioning 101 and auxiliary stimuli detection 105 are Krenicon, MSI or MEG combined with including but not limited to EEG and ECG, Ref. to all 15 Technical Pub. Ref. A.S.N. 08/835,625 and earlier

Ref. Bocker, "... Finger Movement", earlier Ref. to Bocker, "... Foot Movement", Hari, P. 163, Col. 1, 3-25, and H. Walter.

17. Stimuli conditioning 203 A.S.N. 08/835,625 Pg. 23, line 6.

Software includes but is not limited to be BESA as used by Bocker.

> " In the present study, spatio-temporal dipole modeling was carried out using BESA software, ..." earlier Ref. to Bocker, "... Finger Movement", P.277, Lines 34-36. And
> "The general non-uniqueness of the inverse problem is built with in BESA by providing the researcher with tools to incorporate a priori knowledge about the generators (i.e., to impose restrictions) interactively. earlier Ref. to Bocker, "... Finger Movement", P.278 lines 45-48.

Re. A.S.N. 08/835,625:

> "Signal processing is used for enhancing the evaluation of data amid noisy environments and to correct physiological interference." Page 7, Lines 10-11.

Signal processing algorithm examples are:

> "... performing biomagnetic imaging to determine the location and intensity of current sources within the subject ..." earlier Ref. to Kuc, et al., Abstract.
> "...measuring a magnetic field generated by current sources located within a portion of a subject ...", earlier Ref. to Kuc, et al. Col. 14, Line 32.

Re. A.S.N. 08/835,625:

> "Stimuli conditioning 203 is performed by SDC 101 and TCC 100. The SDC 101 corrects or neutralizes interference which is acting on the signals received before passing the signals to the TCC 100." Page 23, Lines 6-8.

The software includes but is not limited to BESA, Ref. Bocker, K.B.E et al. "... Finger Movement", P. 278, 35-55.

18. Stimuli selection 204 in A.S.N. 08/835,625 Page 26, Line 16.

In A.S.N. 08/835,625:

"Stimuli Selection 204 is paramount in the success of the TCS accomplishing its objectives." Page 26, Line 16-17.

Thought Stimuli/Thought Designation is aligned or calibrated by the user informing the system as to which thoughts are voluntary or self paced.

The trainer alerts TCS to accept a new control function while directing the user to produce the desired thought thereby calibrating stimuli selection 204 for said function control 207.

19. Biofeedback discussion:

With TCS the human makes clear spontaneous self-paced voluntary choices to direct the computer to any of a great number of tasks.

Whereas biofeedback is a closed loop system where the entire success of the operation is dependent on iterative processes between the human and physiological meters, each depending on the other. There is no allowance for spontaneity in biofeedback:

> "... whole-head neuromagnetometers provide a global picture of ongoing spontaneous activity, ..." earlier Ref. to Hari, P. 168, Lines 24-25.

20. Support for MEG and other equipments in lieu of MSI. A.S.N. 08/835,625 Pg. 6, 22; 8, 11-15; and 43, 12.

It is well known in the art that Magnetoencephalography (MEG) is an MSI without producing imagery. MEG only provides the raw material for MSI by sensing and conditioning stimuli. The raw material is shown on Table 1 of Ref. to Walter, Pg. 4 of this document. In order to provide Magnetic Source Images, an image source such as an MRI or EEG is fed into an MEG to effect what is called an MSI. "MEG" is addressed in A.S.N. 08/835,625 indirectly at the above-identified pages; two are part of reference quotes and one addresses artifacts interference. A TCS uses the classic MEG a great deal more than MSI because of cost reasons and because most research uses the MEG while incorporating imagery as desired. An example of such research is the A.S.N. 08/835,625 reference:

"The reproducibility of the head position in the MEG device and the MR imaging system is typically 2 mm for a point in the temporal region and about 4mm for a point in the occipital region' Ref. Siefried Schneider. Ph.D., et al. MULTICHANNEL BIOMAGNETIC SYSTEM FOR STUDY OF ELECTRICAL ACTIVITY IN THE BRAIN AND HEART, Radiology 1990; 176-825-830." A.S.N. 08/835,625 Pg. 6, 21 to Pg. 7, 3.

Apparatus utilizing SQUID like MSI "... highly sensitive biomedical magnetism measuring apparatus utilizing a SQUID ...[are] referred to as biomagnetometers, SQUID computed tomography (SQUID CT), magnetic source imaging MSI), biomagnetic imaging (BMI), magnetoencephalograms (MEG), and magnetocardiograms ..." Ref. Patent No. 5,594,849, R. B. Kuc et al.. Col. 1, Lines 19-23.

The MEG is performing a biomagnetometer function when citing in A.S.N. 08/835,625 Pg. 8, Line 12 as being interfered with by artifacts while picking up neuromagnetic signals of interest.

Re. A.S.N. 08/835,625 Page 7, Line 3, Ref. to S. Schneider: Fig. 2 of Ref. S. Schneider portrays a biomagnetic multichannel system usable for measuring magnetic AND electrical potentials of the brain or heart, earlier (Pg. 7) Ref. to Schneider.

Additional reference for MEG used for detecting stimuli from the brain is the earlier Ref. to R. Kristeva, P. 284, Col. 1, Lines 8-18 Re. A.S.N. 08/835,625 "Other modes such as other detectable body emissions may be used as available." Page 19, Line 10-11:

> Other modes as well as combined or incorporated in this mode, at least to enable one skilled in the art to build or use TCS, include but are not limited to MSI, MEG, MRI, EEG, MCG and ECG. Acronym MSI used by Applicant should not restrict the substitution of other modes or equipments from performing the stated task.

Re. A.S.N. 08/835,625: "... other modes, equipments or types of devices will become apparent and possibly preferable from an economic viewpoint prior to MSI cost reduction." Page 19, Line 19-20.

Cost incentive to use other modes: "Recent studies suggest that the spatial localization from electrical (EEG) data may be similar to that from magnetic (MEG) data. ... the cost per channel for EEG is now around 1-5% of that for MEG, ..." Ref. D. M. Tucker, Spatial sampling of head electrical fields: the geodesic sensor net, Electroencephalography and clinical Neurophysiology, Vol. 87 (1993) 154-163, P. 154, Lines 17-23.

I HEREBY DECLARE that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon, or any patent to which this verified statement is directed.

SIGNED at Philadelphia, Pennsylvania, this 12th day of October, 1999.

Edward W. Moll

Edward W. Moll